

WHAT IS CLAIMED IS:

Sub B 1. A hole punch apparatus for perforating sheets moving in a sheet path, said sheet path having spacing between pitches, comprising:

- a. a member rotatable in the direction of the sheet path;
- b. a first punch attached to the rotatable member and positioned to intersect the sheet path when rotated to a position orthogonal to the sheet path;
- c. a second punch attached to the rotatable member, said second punch positioned to intersect the sheet path when rotated to a position orthogonal to the sheet path and positioned at an angle relative to the first punch such that when either the first or second punch intersect the sheet path, the other punch is rotated to a position that does not intersect the sheet path;
- d. a drive mechanism for powering rotation of the rotating member; and
- e. a controller, cooperating with the drive mechanism, for controlling the rotation of the rotatable member such that when one punch is selected for intersection with a sheet in the sheet path, rotation is timed such that the other punch intersects the sheet path in a space between pitches.

2. The hole punch of **claim 1**, wherein the first punch comprises a plurality of punches.

3. The hole punch of **claim 2**, wherein the second punch comprises a plurality of punches.

4. The hole punch of **claim 1**, wherein there is a different number of first punches than the number of second punches.

5. The hole punch of **claim 1**, wherein the paper path has a width dimension and wherein the position of the first punch along the width dimension is variable.

6. The hole punch of **claim 5**, wherein the position of the first punch along the width dimension is continuously variable across at least a segment of the width.

7. The hole punch of **claim 5**, wherein the position of the first position is variable among a plurality of fixedly located positions.

8. The hole punch of **claim 1**, wherein the first and second punches are oriented 180° from each other.

9. The hole punch of **claim 1**, further comprising a third punch.

10. The hole punch of **claim 1**, wherein the paper path has a width dimension and wherein the first and second punches are located at the same position along the width dimension.

11. The hole punch of **claim 1**, wherein the paper path has a width dimension and wherein the first and second punches are located at different positions along the width dimension.

12. The hole punch of **claim 1**, wherein the speed of the drive mechanism is controllable.

13. The hole punch of **claim 1**, wherein the deceleration of the drive mechanism is controllable.

14. The hole punch of **claim 1**, wherein the drive mechanism is an electrical motor controlled by the controller.

15. The hole punch of **claim 1**, further comprising a rotatable punch die member comprising a punch die for receiving each punch while the punch intersects the sheet path.

16. The hole punch of **claim 15**, wherein the rotatable punch die member comprises at least two punch dies.

17. The hole punch of **claim 15**, further comprising a mechanism connecting the rotatable member and the rotatable punch die member such that the punch and the punch die rotate at essentially the same speed.

18. The hole punch of **claim 1**, wherein the leading and trailing edges comprise sheet path edges and wherein the hole punch apparatus further comprises a sensor proximate to the sheet path for detecting a sheet path edge in the sheet path.

19. The hole punch of **claim 18**, wherein the controller uses signals from the sheet path detector in an algorithm to control the drive mechanism.

20. The hole punch of **claim 1**, further comprising sensors, communicating with the controller, for determining the location of a sheet in the sheet path and wherein the controller algorithm uses such data to determine when to activate the drive mechanism.

21. The hole punch of **claim 1**, further comprising sensors, communicating with the controller, for determining the location of a sheet in the sheet path and wherein the controller algorithm uses such data to determine the acceleration of the drive mechanism in order to place the selected punch in the correct location.

22. The hole punch of **claim 1**, further comprising sensors, communicating with the controller, for determining the location of a sheet in the sheet path and wherein the controller algorithm uses such data to determine the deceleration of the drive mechanism in order to place the non-selected punch in a space between pitches.

23. The hole punch of **claim 1**, further comprising a sensor proximate to the sheet path for detecting the trailing edge of a sheet and conveying such detection data to the controller.

24. The hole punch of **claim 1**, further comprising sensors that enable a controller to calculate the velocity of a sheet in the sheet path.

25. A process for making a perforation in a sheet moving in a sheet path, comprising:

a. selecting a first punch on a rotatable punch member for perforating the sheet wherein said rotatable member comprises a second punch positioned at an angle relative to the first punch such that when either first or second punches intersect the sheet path, the other punch is rotated to a position that does not intersect the sheet path;

b. determining the time at which a selected location on a sheet to be perforated will arrive at a location that intersects the selected punch;

c. activating a mechanism that drives the rotatable member the selected punch intersects the sheet path when the sheet location to be punched arrives at the point of intersection between the sheet path and the punch; and

d. controlling the deceleration of the rotatable member such that the non-selected punch intersects the sheet path in a space between pitches.

26. A marking system having a hole punch for perforating sheets moving in a sheet path having spaces between pitches, comprising:

- a. a member rotatable in the direction of the sheet path;
- b. a first punch attached to the rotatable member and positioned to intersect the sheet path when rotated to a position orthogonal to the sheet path;
- c. a second punch attached to the rotatable member, said second punch positioned to intersect the sheet path when rotated to a position orthogonal to the sheet path and positioned at an angle relative to the first punch such that when either the first or second punch intersect the sheet path, the other punch is rotated to a position that does not intersect the sheet path;
- d. a drive mechanism for powering rotation of the rotating member; and
- e. a controller, cooperating with the drive mechanism, for controlling the rotation of the rotatable member such that when one punch is selected for intersection with a sheet in the sheet path, rotation is timed such that the other punch intersects the sheet path in a space between pitches.

27. The marking system of **claim 26**, wherein the marking system comprises and electrophotographic marking engine.